

Control of Phytophthora Root And Crown Rot of Apple Trees

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Phytophthora root and crown rot has caused the decline and death of apple trees in several orchards in southeastern Arizona during the past two years. Symptoms of this disease, in addition to the presence of crown and/or root rot, include the presence of pale green to reddish small leaves, sparse foliage, and the absence of terminal shoot growth.

Phytophthora root and crown rot is a serious disease problem in most areas where apples are grown. Several different species of Phytophthora are known to attack apple trees and cause serious losses to affected orchards. We are sampling orchards affected with root and crown rot to identify the species of Phytophthora causing the decline and death of apple trees in Arizona. To date, four different Phytophthora species have been recovered from decayed roots and bark cankers of apple trees affected with root and crown rot. The same Phytophthora species were recovered from soil adjacent to diseased trees. Of 62 trees samples, Phytophthora cactorum, Phytophthora cambivora, Phytophthora sp. 1, and Phytophthora sp. 2 were recovered from 17, 7, 5, and 1 tree, respectively. Phytophthora cactorum and P. cambivora are known to be virulent pathogens to apple trees. The exact identity of Phytophthora species 1 and 2 are not yet known.

The best method of disease control is to plant clean nursery stock in pathogen-free soil. If Phytophthora root and crown rot is found in an apple orchard, cultural practices such as avoidance of over-irrigation will minimize tree losses.

Metalaxyl (Ridomil), used as soil drench on nonbearing trees, is the only fungicide currently registered for the control of this disease. Fosetyl A1 (Aliette) has been used to control Phytophthora diseases in other crops. Because of the systemic activity of this fungicide, both soil and foliar treatments of fosetyl A1 were applied to apple trees in the following experiments.

Curative Treatments

Twenty trees with mild root rot symptoms were selected. Trees were Red Delicious (Ruby Red Stripe) on seedling rootstock. The four treatments were:

- a. Drench soil surrounding each tree with 22.4 g active ingredient; apply in fall 1984 and every two months (May, July, and September) during the following the growing season.
- b. Drench tree as above in the fall; apply 7.2 g active ingredient to the foliage of each tree three times during the growing season (May, July, and September).
- c. Foliar application as above in the fall and three times during the following growing season.
- d. Untreated.

Trees were scored for disease symptoms prior to treatment and following each fungicide application.

Curative treatments resulted in 60 percent of the treated trees having an improved diseased rating. Forty percent of the untreated trees, however, had fewer disease symptoms during the growing season than prior to treatment

(fall 1984).

Preventative Treatments

These treatments are necessary to inhibit the spread of Phytophthora sp. from infected trees to uninfected, adjacent trees in an orchard. Thirty healthy trees were selected; trees were the same variety, rootstock, and age as in the curative treatment. Treatments were:

- a. Foliar application of 11.2 g active ingredient per tree in fall 1984 and every two months (May, July, and September) during the following growing season.
- b. Foliar application of 22.4 g active ingredient per tree on the same dates.
- c. Untreated.

Trees were scored for disease symptoms as above.

In the preventative treatments, neither the untreated nor the treated trees showed any disease symptoms.

Replant Treatments

Sites in which trees have died of Phytophthora root and crown rot must be replanted. The ability to replant bare-root apple trees in soil known to harbor Phytophthora sp. was investigated. Treatments were:

- a. Drench each newly planted tree with a solution containing 22.4 g active ingredient at time of planting (March 1985); repeat drenches three times, every two months, during the growing season.
- b. Soak each bare-root tree in solution containing 4.8 g active ingredient for three days prior to planting.
- c. Drench newly planted tree as in (a); follow with foliar treatment of 7.2 g active ingredient per tree three times, every two months, during the growing season.
- d. Untreated.

Twenty replant trees were used; trees were Red Delicious (Scarlet Spur) on EM 7a rootstock. Trees were scored for disease symptoms at time of planting and following each fungicide treatment.

Trees in treatments (b) and (c), as well as untreated trees, remained healthy. Several trees in treatment (b) appear especially vigorous with excellent terminal shoot growth. Replant treatment (a), however, did not eliminate disease. Forty percent of these trees showed disease symptoms during the summer of 1985.

Experiments will continue throughout the 1985-1986 growing season. Curative, preventative, and replant treatments with fosetyl A1 may provide another means to control root and crown rot in apple orchards.